

AMEC FOSTER WHEELER
BUNKER HILL CENTRAL TREATMENT PLANT UPGRADE PROJECT
Kellogg, Idaho

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DATA VALIDATION REPORT

Bunker Hill Central Treatment Plant

Kellogg, Idaho

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TABLE OF CONTENTS

	Page
ACRONYMS.....	iii
1.0 INTRODUCTION.....	1
2.0 DATA VALIDATION METHODOLOGY	1
3.0 EXPLANATION OF DATA QUALITY INDICATORS	2
3.1 Laboratory Control Sample Recoveries.....	2
3.2 Matrix Spike Recoveries	3
3.3 Blank Concentrations	3
3.4 Laboratory Duplicates	3
4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE ADDED DURING DATA VALIDATION	4
5.0 QUALIFICATION REASON CODES	4
6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION	4
7.0 SPECIFIC DATA VALIDATION FINDINGS.....	4
7.1 Metals By EPA Method 200.7	5
7.1.1 Holding Times	5
7.1.2 Initial and Continuing Calibration Verification.....	5
7.1.3 Initial and Continuing Calibration Blanks	5
7.1.4 Laboratory, Equipment, and Trip Blanks	5
7.1.5 Laboratory Control Sample Accuracy and Precision.....	5
7.1.6 Laboratory Duplicates	5
7.1.7 Matrix Spikes/Matrix Spike Duplicates	6
7.1.8 Analytical Sensitivity.....	7
7.1.9 Data Reporting and Analytical Procedures	7
7.2 Total Suspended Solids by SM 2540D	7
7.2.1 Holding Times	7
7.2.2 Laboratory Blanks	7
7.2.3 Laboratory Control Sample Accuracy and Precision.....	7
7.2.4 Laboratory Duplicates	7
7.2.5 Analytical sensitivity	8
7.2.6 Data Reporting and Analytical Procedures	8
7.3 pH by SM 4500 H-B	8
7.3.1 Holding Times	8
7.3.2 Laboratory Control Sample Accuracy.....	8
7.3.3 Laboratory Duplicates	8
7.3.4 Data Reporting and Analytical Procedures	8
8.0 FIELD DUPLICATES	8
9.0 SUMMARY AND CONCLUSIONS.....	9
REFERENCES.....	10
LIMITATIONS.....	11

TABLES

Table 1	Field Samples Submitted to SVL Analytical, Inc.
Table 2	Qualifiers Added During Data Validation
Table 3	Field Duplicate Detections

ACRONYMS

%	percent
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
CCB	continuing calibration blank
CCV	continuing calibration verification
CLP	Contract Laboratory Program
COC	chain of custody
EPA	United States Environmental Protection Agency
ICAL	initial calibration
ICV	initial calibration verification
ID	identification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
QC	quality control
RL	reporting limit
RPD	relative percent difference
SAP	sampling and analysis plan
SM	Standard Method
SVL	SVL Analytical Inc.
TSS	total suspended solids
Wood	Wood Environment & Infrastructure Solutions, Inc.

DATA VALIDATION REPORT

Bunker Hill Central Treatment Plant

Kellogg, Idaho

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, Inc. (Wood, formerly Amec Foster Wheeler Environment & Infrastructure, Inc. [Amec Foster Wheeler]) collected 28 water samples (including 3 field duplicates, a trip blank, and an equipment blank) between March 26 and April 30, 2018 from the Bunker Hill Central Treatment Plant in Kellogg, Idaho. Wood submitted the samples to SVL Analytical Inc. (SVL), located in Coeur D'Alene, Idaho, where they were assigned to sample delivery groups X8C0467, X8D0001, X8D0002, X8D0038, X8D0100, X8D0132, X8D0133, X8D0187, X8D0233, X8D0268, X8D0269, X8D0309, X8D0386, X8D0420, X8D0467, X8D0542, and X8D0575. SVL analyzed the samples for total metals by United States Environmental Protection Agency (EPA) Method 200.7, total suspended solids (TSS) by Standard Methods for the Examination of Water and Wastewater (SM) 2540D; and pH by SM 4500-H B. A list of these samples by field sample identification (ID), sample collection date, and the laboratory sample IDs is presented in Table 1.

2.0 DATA VALIDATION METHODOLOGY

Wood performed Stage 4 validation on samples KT-04-02-18, KT-04-05-18, and PTM-04-05-18. The Stage 4 validation includes review and recalculation of the laboratory's analytical report and the raw analytical data. The remainder of the data underwent EPA Stage 2B validation, which includes review of sample- and instrument-specific quality control (QC) samples on data summary forms, but does not include review or validation of the raw analytical data. This data validation has been performed in general accordance with:

- Amec Foster Wheeler, 2017. Operations & Maintenance Services Sampling and Analysis Plan (SAP), Bunker Hill Central Treatment Plant Upgrade Project, Kellogg, Idaho, March 2017.
- EPA, 2017. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review, EPA-540 R 017 001.
- The analytical methods referenced by the laboratory.

The laboratory's certified analytical report and supporting documentation were reviewed to assess the following:

- Data package and electronic data deliverable completeness;
- Chain-of-custody (COC) compliance;
- Sample Receipt;
- Holding time compliance;
- Initial calibration (ICAL), initial calibration verification (ICV), and continuing calibration verification (CCV) compliance with method specified criteria;
- Presence or absence of laboratory contamination as demonstrated by calibration and laboratory blanks;
- Accuracy and bias as demonstrated by recovery of surrogate spikes, laboratory control sample (LCS), and matrix spike (MS) samples;
- Analytical precision as relative percent difference (RPD) of analyte concentration between laboratory duplicates, LCSs/LCS duplicates (LCSDs), or MS/MS duplicates (MSDs);
- Sampling and analytical precision as RPD of analyte concentration between field duplicates;
- Internal standard and surrogate compound recoveries;
- Analyte identification and quantification verification from raw analytical data (Stage 4 validation only); and
- Insofar as possible, the degree of conformance to method requirements and good laboratory practices

3.0 EXPLANATION OF DATA QUALITY INDICATORS

Summary explanations of the specific data quality indicators reviewed during data validation are presented below.

3.1 LABORATORY CONTROL SAMPLE RECOVERIES

LCSs are aliquots of analyte free matrices that are spiked with the analytes of interest for an analytical method, or a representative subset of those analytes. The spiked matrix is then processed through the same analytical procedures as the samples they accompany. LCS recovery is an indication of a laboratory's ability to successfully perform an analytical method in an interference free matrix.

3.2 MATRIX SPIKE RECOVERIES

MSs and MSDs are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of a laboratory's ability to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

3.3 BLANK CONCENTRATIONS

Blank samples are aliquots of analyte free matrix that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results.

Laboratory blanks are processed by the laboratory using exactly the same procedures as the field samples. Target analytes should not be found in laboratory blanks.

Equipment blanks are prepared by passing analyte free water through or over sample collection equipment and collecting the water in sample containers. Equipment blanks are used to monitor for possible sample contamination during the sample collection process and serve as a check on the effectiveness of field decontamination procedures.

Trip blanks are vials of analyte free water that accompany sample bottles shipped to the field and back to the laboratory with field samples. Trip blanks assess contamination attributed to shipping and handling procedures, as well as contamination from containers. Target analytes should not be found in trip blanks.

Target analytes should not be found in laboratory blanks. When target analytes are detected in blanks, analyte concentrations in associated samples less than 5 times the concentration detected in the blank will be U qualified as being not detected.

3.4 LABORATORY DUPLICATES

Laboratory duplicate analysis verifies acceptable method precision by the laboratory at the time of preparation and analysis and/or sampling precision at the time of collection.

4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE ADDED DURING DATA VALIDATION

- J** The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- R** The sample result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
- U** The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- UJ** The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

5.0 QUALIFICATION REASON CODES

The following reason codes were applied to the data during data validation:

- DL** The analyte concentration is between the method detection limit (MDL) and the reporting limit (RL).
- HD** High RPD between laboratory duplicate results.
- HT** The EPA-recommended maximum holding time was exceeded.

6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

The samples were received at the laboratory under proper COC, intact, properly preserved, and at temperatures less than the SAP-specified maximum of 6 degrees Celsius.

7.0 SPECIFIC DATA VALIDATION FINDINGS

Results from these samples may be considered usable with the limitations and exceptions described in Sections 7.1 through 8.0. Qualifiers added during validation are summarized in Table 2.

7.1 METALS BY EPA METHOD 200.7

Total metals results generated by SVL may be considered usable with the limitations described in Sections 7.1.1 through 7.1.9.

7.1.1 Holding Times

All samples were analyzed for metals within the SAP-specified holding of 180 days.

7.1.2 Initial and Continuing Calibration Verification

ICV and CCV recoveries were within method-specified limits, with the following exception:

- Manganese recovery was high at 138 percent (%) in the low level CCV associated with the analysis of sample 006-04-02-18. Manganese was detected in the associated sample at a concentration greater than 10 times the concentration of the low level CCV and data usability is not adversely affected by the potential high analytical bias.

7.1.3 Initial and Continuing Calibration Blanks

Target analytes were not detected in the initial calibration blanks and continuing calibration blanks (CCBs), with the following exception:

- Manganese was detected at a concentration of 0.0034 milligrams per liter (mg/L) in the calibration blank associated with the analysis of sample 006-04-13-18. Manganese was detected in the associated sample at a concentration greater than 5 times the concentration detected in the blank and data usability is not adversely affected by the blank detection.

7.1.4 Laboratory, Equipment, and Trip Blanks

Target analytes were not detected in the laboratory, equipment, and trip blanks associated with the analysis of these samples.

7.1.5 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the SAP-specified limits and RPDs between the LCS and LCSD results were less than the SAP-specified maximum of 20%.

7.1.6 Laboratory Duplicates

SVL performed duplicate analyses on project samples KT-03-26-18, 006-04-02-18, TB-04-04-18, 006-04-04-18, 006-04-06-18, 006-04-09-18, KT-04-09-18, 006-04-11-18, 006-04-13-18, 006-04-16-18, PTM-04-19-18, 006-04-18-18, 006-04-20-18, 006-04-23-18, and 006-04-27-18.

RPDs between source and duplicate results were less than the SAP-specified maximum of 20%, with the following exceptions:

- The RPD between zinc results was high at 35.2% in the duplicate analysis performed on sample 006-04-25-18. Wood J qualified the detected zinc result from sample 006-04-25-18 due to potential analytical imprecision. (J-HD)
- The RPD between cadmium results was high at 26.7% in the duplicate analysis performed on sample 006-04-30-18. Wood J qualified the detected cadmium result from sample 006-04-25-18 due to potential analytical imprecision. (J-HD)
- The RPD between lead results was high at 22.4% in the duplicate analysis performed on sample 006-04-20-18, but the difference between primary and duplicate results was less than the RL, demonstrating acceptable analytical precision. No data were qualified based on the high RPD.

7.1.7 Matrix Spikes/Matrix Spike Duplicates

SVL performed MS and MSD analyses on project samples KT-03-26-18, 006-04-02-18, TB-04-04-18, 006-04-04-18, 006-04-06-18, 006-04-09-18, KT-04-09-18, 006-04-11-18, 006-04-13-18, 006-04-16-18, PTM-04-19-18, 006-04-18-18, 006-04-20-18, 006-04-23-18, 006-04-25-18, 006-04-27-18, and 006-04-30-18 for total metals. MS/MSD recoveries were within SAP-specified limits and RPDs between MS and MSD results were less than the laboratory-specified maximum of 20%, with the following exceptions:

- Manganese (700%, -197%) and zinc (446%, -77.5%) recoveries were outside the SAP-specified limits in the MS and MSD performed on sample KT-03-26-18. Manganese and zinc were detected in the native unspiked sample at concentrations greater than 4 times the spike concentrations and it is not possible to assess data usability for these analytes based on MS recoveries.
- Zinc recoveries were outside the SAP-specified limits at 24.0% and 172% in the MS and MSD performed on sample KT-04-09-18. Zinc was detected in the native unspiked sample at a concentration greater than 4 times the spike concentrations and it is not possible to assess data usability for zinc based on MS recoveries.
- Manganese recoveries were outside the SAP-specified limits in the MS and/or MSD performed on samples 006-04-02-18 (69.9%, MS), 006-04-04-18 (57.8%, MS), 006-04-06-18 (54.5%, MSD), 006-04-09-18 (63.2%, MS), 006-04-16-18 (56.7%, MSD), 006-04-18-18 (152%, 128%), 006-04-20-18 (60.9%, MS), 006-04-23-18 (142%, 154%), and 006-04-27-18 (38.6%, MSD). Manganese was detected in the native unspiked samples at concentrations greater than 4 times the spike concentrations and it is not possible to assess data usability for these analytes based on MS recoveries.

7.1.8 Analytical Sensitivity

Wood compared RLs for cadmium, lead, manganese, and zinc against applicable discharge limits to confirm that the RLs were sufficiently low to meet the discharge limits. Non-detect results were reported to RLs less than the applicable discharge limits.

7.1.9 Data Reporting and Analytical Procedures

SVL J qualified analytes with concentrations between the MDL and the RL. Wood agrees that these results are quantitatively uncertain and has maintained SVL's J qualifiers. (J-DL)

7.2 TOTAL SUSPENDED SOLIDS BY SM 2540D

TSS results generated by SVL may be considered usable with the limitations described in Sections 7.2.1 through 7.2.6.

7.2.1 Holding Times

All samples were analyzed for TSS within the SAP-specified holding time of 7 days.

7.2.2 Laboratory Blanks

TSS was not detected in the laboratory blanks associated with the analysis of these samples.

7.2.3 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the laboratory-specified 90 to 110% limits and RPDs between the LCS and LCSD results were less than the laboratory-specified maximum of 10%.

7.2.4 Laboratory Duplicates

SVL performed duplicate analyses on project samples 006-04-02-18, 006-04-04-18, 006-04-06-18, 006-04-09-18, 006-04-11-18, 006-04-13-18, 006-04-16-18, 006-04-18-18, 006-04-20-18, 006-04-23-18, 006-04-25-18, 006-04-27-18, and 006-04-30-18. RPDs between source and duplicate results were less than laboratory-specified maximum of 10%, with the following exception:

- RPDs between TSS results were high in the duplicate analyses performed on samples 006-04-02-18 and 006-04-30-18 at 138.0% and 13.3%, respectively. In both cases the differences between primary and duplicate results were less than the RL, demonstrating acceptable analytical precision.

7.2.5 Analytical sensitivity

Wood compared RLs for TSS against applicable discharge limits to confirm that the RLs were sufficiently low to meet the discharge limits. Non-detect results were reported to RLs less than the applicable discharge limits.

7.2.6 Data Reporting and Analytical Procedures

SVL J qualified analytes with concentrations between the MDL and the RL. Wood agrees that these results are quantitatively uncertain and has maintained SVL's J qualifiers. (J-DL)

7.3 PH BY SM 4500 H-B

pH results generated by SVL may be considered usable with the limitations described in Sections 7.3.1 through 7.3.4.

7.3.1 Holding Times

All field samples were analyzed for pH after the EPA-recommended maximum hold time of 15-minutes from sample collection. Wood J qualified the pH results from these samples because of the missed hold times. (J-HT)

7.3.2 Laboratory Control Sample Accuracy

LCS recoveries were within the laboratory-specified 98.5 to 101.5% limits.

7.3.3 Laboratory Duplicates

SVL performed duplicate analyses on samples 006-04-02-18, 006-04-04-18, 006-04-06-18, 006-04-09-18, 006-04-11-18, 006-04-13-18, 006-04-16-18, 006-04-16-18, 006-04-20-18, 006-04-23-18, 006-04-25-18, 006-04-27-18 and 006-04-30-18. RPDs between source and duplicate results were less than laboratory-specified maximum of 5%.

7.3.4 Data Reporting and Analytical Procedures

There were no anomalies associated with the pH analysis of these samples.

8.0 FIELD DUPLICATES

Field duplicates were collected with samples: 006-04-04-18 (QC-04-04-18), KT-04-16-18 (QC-04-16-18), and PTM-04-19-18 (QC-04-19-18). Target analyte detections are summarized in Table 3. Precision values were less than the SAP-specified maximum of 30%, or the differences between detected concentrations were less than the RL, demonstrating acceptable sampling and analytical precision.

9.0 SUMMARY AND CONCLUSIONS

Wood reviewed 153 data records from field samples during this validation. All the data generated are usable and of acceptable quality with the addition of qualifiers presented in Table 2. Qualifier definitions are summarized in Section 4.0, reason codes are summarized in Section 5.0, and qualified data are summarized below.

- Wood J qualified 35 records (22.8%) as being estimated concentrations because of hold time exceedances, imprecision between laboratory duplicate results, or analyte concentrations between the MDL and RL.

No records were rejected and 100% of the data should be considered valid with the addition of the qualifiers presented in Table 2.

REFERENCES

Amec Foster Wheeler, 2017. Operations & Maintenance Services Sampling and Analysis Plan (SAP), Bunker Hill Central Treatment Plant Upgrade Project, Kellogg, Idaho, March 2017.

EPA, 2017. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001.

LIMITATIONS

This report was prepared exclusively for the Bunker Hill Central Treatment Plant by Wood Environment & Infrastructure Solutions, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in Wood services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This data validation report is intended to be used by the Bunker Hill Central Treatment Plant in Kellogg, Idaho only, subject to the terms and conditions of its contract with Wood. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

TABLE 1
Field Samples Submitted to SVL Analytical, Inc.
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Field Sample ID	Collection Date	SVL Analytical, Inc. Sample ID	Notes
KT-03-26-18	3/26/2018	X8C0467-01	
KT-03-29-18	3/29/2018	X8C0467-02	
006-04-02-18	4/2/2018	X8D0001-01	
KT-04-02-18	4/2/2018	X8D0002-01	Stage 4 Validation
RB-04-04-18	4/4/2018	X8D0002-02	Equipment Blank
TB-04-04-18	4/4/2018	X8D0002-03	Trip Blank
KT-04-05-18	4/5/2018	X8D0002-04	Stage 4 Validation
PTM-04-05-18	4/5/2018	X8D0002-05	Stage 4 Validation
006-04-04-18	4/4/2018	X8D0038-01	
QC-04-04-18	4/4/2018	X8D0038-02	Field Duplicate of 006-04-04-18
006-04-06-18	4/6/2018	X8D0100-01	
006-04-09-18	4/9/2018	X8D0132-01	
KT-04-09-18	4/9/2018	X8D0133-01	
KT-04-12-18	4/12/2018	X8D0133-02	
006-04-11-18	4/11/2018	X8D0187-01	
006-04-13-18	4/13/2018	X8D0233-01	
006-04-16-18	4/16/2018	X8D0268-01	
KT-04-16-18	4/16/2018	X8D0269-01	
QC-04-16-18	4/16/2018	X8D0269-02	Field Duplicate of KT-04-16-18
KT-04-19-18	4/19/2018	X8D0269-03	
PTM-04-19-18	4/19/2018	X8D0269-04	
QC-04-19-18	4/19/2018	X8D0269-05	Field Duplicate of PTM-04-19-18
006-04-18-18	4/18/2018	X8D0309-01	
006-04-20-18	4/20/2018	X8D0386-01	
006-04-23-18	4/23/2018	X8D0420-01	
006-04-25-18	4/25/2018	X8D0467-01	
006-04-27-18	4/27/2018	X8D0542-01	
006-04-30-18	4/30/2018	X8D0575-01	

Notes:

ID = identification

TABLE 2
Qualifiers Added During Data Validation
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Sample ID	Methods	Analytes	Concentrations	Qualifiers and Reason Codes
006-04-02-18	SM 2540D	TSS	0.4 mg/L	J DL
006-04-02-18	4500H	pH	6.9 SU	J HT
006-04-04-18	4500H	pH	7.0 SU	J HT
006-04-06-18	4500H	pH	7.0 SU	J HT
006-04-09-18	4500H	pH	7.0 SU	J HT
006-04-11-18	4500H	pH	6.9 SU	J HT
006-04-13-18	4500H	pH	6.7 SU	J HT
006-04-16-18	4500H	pH	6.9 SU	J HT
006-04-16-18	EPA 200.7	Lead	0.0042 mg/L	J DL
006-04-18-18	4500H	pH	6.8 SU	J HT
006-04-20-18	4500H	pH	6.5 SU	J HT
006-04-20-18	EPA 200.7	Lead	0.0057 mg/L	J DL
006-04-23-18	SM 2540D	TSS	0.6 mg/L	J DL
006-04-23-18	4500H	pH	6.9 SU	J HT
006-04-25-18	4500H	pH	6.9 SU	J HT
006-04-25-18	EPA 200.7	Zinc	0.191 mg/L	J HD
006-04-27-18	4500H	pH	6.7 SU	J HT
006-04-27-18	EPA 200.7	Lead	0.0049 mg/L	J DL
006-04-30-18	4500H	pH	6.7 SU	J HT
006-04-30-18	EPA 200.7	Cadmium	0.0080 mg/L	J HD
KT-03-26-18	4500H	pH	3.0 SU	J HT
KT-03-29-18	4500H	pH	2.8 SU	J HT
KT-04-02-18	4500H	pH	3.1 SU	J HT
KT-04-05-18	4500H	pH	3.1 SU	J HT
KT-04-09-18	4500H	pH	2.8 SU	J HT
KT-04-12-18	4500H	pH	3.0 SU	J HT
KT-04-16-18	4500H	pH	3.0 SU	J HT
KT-04-19-18	4500H	pH	3.0 SU	J HT
PTM-04-05-18	4500H	pH	7.4 SU	J HT
PTM-04-19-18	SM 2540D	TSS	0.8 mg/L	J DL
PTM-04-19-18	4500H	pH	7.3 SU	J HT
QC-04-04-18	4500H	pH	6.9 SU	J HT
QC-04-16-18	4500H	pH	3.0 SU	J HT
QC-04-19-18	SM 2540D	TSS	0.6 mg/L	J DL
QC-04-19-18	4500H	pH	7.3 SU	J HT

Notes:

mg/L = milligrams per liter

EPA = United States Environmental Protection Agency

ID = Identification

SM = Standard Method

SU = Standard Units

TSS = Total Suspended Solids

Qualifier Definition:

J = The analyte was positively identified; the associated numerical value is approximate.

Reason Codes:

DL = The analyte concentration is between the method detection limit (MDL) and the reporting limit (RL).

HD = High relative percent difference between laboratory duplicate results.

HT = The EPA-recommended maximum holding time was exceeded.

TABLE 3
Field Duplicate Detections
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Analyte	Method	Average RL	Primary Concentration	Field Duplicate Concentration	RPD
006-04-04-18 and QC-04-04-18					
TSS	2540D	1.0 mg/L	2.0	2.0	0.0%
pH	4500H	SU	7.0 J	6.9 J	1.4%
Manganese	EPA 200.7	0.00800 mg/L	24.1	22.7	6.0%
Zinc	EPA 200.7	0.0100 mg/L	0.212	0.202	4.8%
KT-04-16-18 and QC-04-16-18					
TSS	2540D	5.0 mg/L	90.0	93.0	3.3%
pH	4500H	SU	3.0	3.0	0.0%
Cadmium	EPA 200.7	0.00200 mg/L	0.176	0.178	1.1%
Lead	EPA 200.7	0.00750 mg/L	0.818	0.825	0.9%
Manganese	EPA 200.7	0.0400 mg/L	46.6	48.1	3.2%
Zinc	EPA 200.7	0.0500 mg/L	47.7	48.2	1.0%
PTM-04-19-18 and QC-04-19-18					
TSS	2540D	1 mg/L	0.8 J	0.6 J	28.6%
pH	4500H	SU	7.3	7.3	0.0%
Lead	EPA 200.7	0.00750 mg/L	0.0232	0.0227	2.2%
Cadmium	EPA 200.7	0.00200 mg/L	1.11	1.14	2.7%
Zinc	EPA 200.7	0.0100 mg/L	11.0	11.4	3.6%

Notes:

mg/L = milligrams per liter

SU = standard units

EPA = United States Environmental Protection Agency

TSS = Total Suspended Solids

RPD = relative percent difference

RL = reporting limit

Method:

2540D = Total Suspended Solids by SM 2540D

4500H = pH by SM 4500 H-B

EPA 200.7 = Metals by EPA Method 200.7

Qualifiers

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample